24. (amended) A method of manufacturing a power splitter comprising the steps of:

a) providing a plurality of layers of low temperature co-fired ceramic;

b) punching a plurality of holes in the low temperature co-fired ceramic layers;

c) filling the holes with a conductive material to form a plurality of vias;

d) screening a plurality of circuit features onto the layers;

e) stacking the layers;

f) firing the stacked layers in an oven to form a unitary substrate; and

g) attaching a transformer to a top layer of the substrate; and

h) connecting the circuit features to the transformer.

Remarks

The following are applicant's response to issues raised in the order as presented in the Office Action.

Priority:

The priority reference to the provisional application has been added. Withdrawal of the priority objection is respectfully requested.

Drawing Objection:

The drawings were objected to. Figures 14 and 15 have been added. No new matter has been added. Support for figures 14 and 15 is found on page 2, 1st

paragraph and in claims 9-11 and 20-22. Withdrawal of the drawing objection is respectfully requested.

Specification Objection:

The specification was objected to as not adequately describing the cascaded splitters. Accordingly, the specification has been amended to further describe the cascaded splitters. Support for this is found on page 2, 1st paragraph and in claims 9-11 and 20-22. Withdrawal of the specification objection is respectfully requested.

Rejection under 35 U.S.C. 103:

Claims 1-28 were rejected under 35 U.S.C. 103 as being unpatentable over Tanigawa (JP62-147808 in view of Branchevsky (US6,252,761) and Rosenberg (US4,516,092).

Claims 1, 5, 12 and 24 have been amended. Claims 13 and 14 have been canceled. Claims 1-12 and 15-28 are pending.

Tanigawa discloses a power splitter having a binocular core transformer. Branchevsky discloses a low temperature co-fired ceramic device. Rosenberg discloses an inductor and mounting technique.

Neither Tanigawa, Branchevsky nor Rosenberg, teach, disclose or suggest as in amended claim 1, a power splitter that has a substrate with several layers. A resistor is formed on a top layer. A capacitor is formed between two of the layers. A transformer is attached to the top layer and is electrically connected to the resistor and the

capacitor. The transformer provides impedance matching and dividing. Vias extend between the layers to provide an electrical connection between the resistor, capacitor and transformer.

Specifically, the device of Branchevsky does not show a resistor mounted on the top layer. Further, Branchevsky does not disclose a resistor connected to a capacitor. In contrast, the device of Branchevsky buries a capacitor within a substrate and gives no suggestion of mounting a resistor. This is clearly different than the present invention.

It would not be obvious to modify the device of Tanigawa to include mounting the transformer on the top surface of a low temperature co-fired ceramic. As the Court of Appeals for the Federal Circuit has set forth, even if a prior art reference could be modified to construct an applicant's invention, the modification is not obvious unless there is a suggestion in the prior art. *In re Laskowski*, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989). There is no suggestion to modify Tanigawa to include mounting a transformer on a low temperature co-fired ceramic with resistors and capacitors. Further, there is no suggestion in Tanigawa to use vias to interconnect the transformer, capacitors and resistors.

If the device of Tanigawa was combined with the device of Branchevsky and Rosenberg, a resistor on the top layer would not be present. Tanigawa, Branchevsky and Rosenberg are silent in regards to placement and interconnection of a resistor for use with a power splitter.

Dependent claims 2-11 depend from independent claim 1 and add additional patentable features and are allowable therewith.

Neither Tanigawa, Branchevsky nor Rosenberg, teach, disclose or suggest as in amended claim 12, a power splitter that provides impedance matching and dividing. The power splitter has an input port and a first and second output port. A multi-layered low temperature co-fired ceramic substrate has a top surface and a bottom surface. Terminals are located on the top surface. A transformer is attached to the upper surface and is electrically connected to the terminals. Vias extend through the substrate. A resistor is formed on the top surface and is electrically connected between the first and second output ports. A capacitor is formed within the substrate and is electrically connected between the transformer and a ground connection.

Specifically, the device of Branchevsky does not show a resistor on the top surface. Further, Branchevsky does not disclose a resistor connected to a capacitor between output ports. In contrast, the device of Branchevsky buries a capacitor within a substrate and gives no suggestion of mounting a resistor. This is clearly different than the present invention.

It would not be obvious to modify the device of Tanigawa to include mounting resistors and a transformer on the top surface of a low temperature co-fired ceramic. As the court of Appeals for the Federal Circuit has set forth, even if a prior art reference could be modified to construct an applicant's invention, the modification is not obvious unless there is a suggestion in the prior art. *In re Laskowski*, 10 USPQ2d 1397, 1398

(Fed. Cir. 1989). There is no suggestion to modify Tanigawa to include mounting a transformer or resistors on the top surface of a low temperature co-fired ceramic.

If the device of Tanigawa was combined with the device of Branchevsky and Rosenberg, there would be no resistors in the combination.

Dependent claims 16-23 depend from independent claim 12 and add additional patentable features and are allowable therewith.

Method claims 24-28 are allowable for the same reasons advanced for independent claims 1 and 12. The cited references either alone or in combination fail to disclose a method of making a power splitter in the claimed manner.

Conclusion:

In view of the current amendments and remarks, the claims are now believed to be in condition for allowance. Attached is a version entitled, "Version with markings to show changes made", with the changes to the application indicated.

Respectfully submitted,

Kevin Redmond

Kevin Redmond
Reg. No. 27,049

Version with Markings to show changes made

In the drawings:

Figures 14 and 15 have been added.

In the specification:

The following paragraph after the title on page 1 has been added:

This application claims priority to US provisional patent application serial number 60/297,597 filed on 06/12/ 2001 and entitled, "Miniature Power Splitter", which is herein incorporated by reference in entirety.

The following paragraph after -40 C to 85 C has been added on page 7:

Power splitter 20 can be used to make 4-way and 8-way splitters as well as higher order splitters. Since power splitter 20 is a 2-way power splitter, the 2-way splitter is cascaded to form 4-way and 8-way power splitters. Multiple power splitters 20 are mounted side by side on a printed circuit board. There are several advantages of cascading power splitter 20. First, the small size of power splitter 20 makes cascading practical because the higher order splitter is still very small. It is still possible to fit multiple splitters 20 used in 4 & 8-way splitters in a small space. Second, using the same 2-way splitter repeatedly in high volume reduces cost because the same splitter parts can be bought in large volume and at reduced cost. Referring to

figures 14 and 15, a 4-way and 8-way splitter is shown. Figure 14 shows three 2 way splitters 20 cascaded to form 4-way splitter 140. Splitters 20 with substrate 40 are mounted side by side on a printed circuit board 150. An input port 152 is commoned through circuit line 158 to the input port 5 of splitters 20. The output ports 1 and 2 of splitters 20 are connected through other circuit lines 158 to the inputs (port 5) of the other two splitters. The outputs of the two splitters (port 1, port 2) are connected through circuit lines 158 to four output ports 153, 154, 155 and 156. Figure 15 shows seven 2 way splitters 20 cascaded to form 8-way splitter 160. 8-way splitter 160 has two 4-way splitters 140 connected by an additional splitter. Splitters 20 with substrate 40 are mounted side by side on printed circuit board 150. An input port 152 is connected to the input (port 5) of a splitter 20 which in turn is connected to two 4-way splitters 140 through circuit line 158. The outputs 153, 154, 155 and 156 are commoned through circuit line 158 to input port 5 of splitters 20. The output ports 1 and 2 of splitters 20 are connected through other circuit lines 158 to four output ports 161, 162, 163, 164, 165, 166, 167 and 168.

In the claims:

Claims 13 and 14 have been canceled.

The following claims have been amended:

1. (amended) A power splitter comprising:

a) a substrate having a plurality of layers;

b) a resistor formed on ~~one of the~~ a top layers;

c) a capacitor formed between two of the layers;

d) a transformer attached to the ~~substrate~~ top layer and electrically connected to the resistor and capacitor, the transformer providing impedance matching and dividing; and

e) a plurality of vias extending between the layers for providing electrical connections between the resistor, capacitor and transformer.

5. (amended) The power splitter according to claim 4 wherein a plurality of terminals are located on the top ~~an upper~~ layer.

12. (amended) A power splitter for providing impedance matching and dividing, the power splitter having an input port and a first and second output port, the power splitter comprising:

a) a multi-layered low temperature co-fired ceramic substrate, the substrate having a top surface and a bottom surface;

b) a plurality of terminals located on the top surface;

c) a transformer attached to the ~~upper~~ top surface and electrically connected to the terminals; ~~and~~

d) a plurality of vias extending through the substrate for providing an electrical connection between the terminals and the bottom surface;

e) a resistor formed on the top surface and electrically connected between the first and second output ports; and

f) a capacitor formed within the substrate and electrically connected between the transformer and a ground connection.

24. (amended) A method of manufacturing a power splitter comprising the steps of:

a) providing a plurality of layers of low temperature co-fired ceramic;

b) punching a plurality of holes in the low temperature co-fired ceramic layers;

c) filling the holes with a conductive material to form a plurality of vias;

d) screening a plurality of circuit features onto the layers;

e) stacking the layers;

f) firing the stacked layers in an oven to form a unitary substrate; ~~and~~

g) attaching a transformer to a top layer of the substrate; and

h) connecting the circuit features to the transformer.